Space Weather Forecast

Issued on Tuesday, 20 December 2022 at 13:26 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of Moderate-class X-ray flares and Minor Geomagnetic Storms.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low, with occasional common class flares. There are seven sunspot groups on the disc. The most active is in the northwest and consists of three mature, small but similarly sized spots connected to much smaller spots in its trailer region, and with some spreading of spots observed. A further smaller region follows this but is slightly a more complex region, comprised of a small mature spot, but with a collection of smaller opposite polarity spots to the west and east of this main spot. The largest region is in the southwest, and whilst it has remained relatively inactive with its trailing spot weakening, it has seen its largest leader spot grow with further sunspots emerging near it. The other spots are generally smaller and simple. There are no Earth-directed CMEs, (coronal mass ejections). There is also large filament, or line of plasma, across the southern centre disc that will be monitored for any potential lift. Given its position this could produce an Earth-directed CME, if it was to occur.

Solar Wind / Geomagnetic Activity: Solar winds have been indicative of a weak transient feature passing Earth, perhaps due to a glance from a CME, and potentially coupled with the arrival of a weak enhancement from a coronal hole. The CME arrival would have been before this 24 hour period, at around 18/2000 UTC, but with ongoing influence into this period. Despite solar winds speeds persisting at background, around 300-350 km/s, this enhancement is most clear looking at the magnetic field. The total magnitude was Moderate, but the important north-south direction showed a rotation through the period from around weakly negative (southward) to moderately positive (northward). Geomagnetic activity remained Quiet, however.

Energetic Particles / Solar Radiation: The count rate of observed energetic particles (high energy protons) remained at background with no solar radiation storms being observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Low to Moderate, with occasional common class flares and an ongoing likelihood of isolated Moderate flares. The most likely source is either the large sunspot in the southwest, or the two sunspots in the northeast. These also bring a very slight chance of Strong class flares.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs, however a weak CME from the 18th has the small chance for a glancing interaction as it passes ahead of the Earth on day 3 (22nd). Onset of fast winds from a coronal hole are expected day 1-2 (20th-21st), before only easing slightly through the following days (22nd-23rd). However confidence is low with strength and timing of any enhancement. Quiet geomagnetic activity at first, is expected to become Unsettled to Active later day 1 or day 2 (20th, 21st) with a chance of isolated G1/Minor Storm intervals. This chance decreases Day 3 and 4 (22nd and 23rd) with Quiet to Unsettled conditions following, and a chance of further Active intervals.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to persist at background with no solar radiation storms occurring. Although

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there is a slight chance of this increasing count rate increasing with any notable flares, and potentially approaching or reaching the S1 Minor Radiation Storm level.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	30	40	20	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	60	50	40	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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